

Place Eighteen Condominium

Address: **1811 Eagle Harbor Dr., Bainbridge Island**

Region: **South Shore - Western Eagle Harbor**

Designer: **Myers Biodynamics, Inc.**

Contractor: **Sea Level Construction**

Owner: **Place 18 Homeowners Association**

Shoreline Type: **Beach / Mudflat / Low bluff**

Project Type: **Toe protection,
Beach Nourishment**

Wave Energy: **Low**

Tides: **MHHW: +11.6
Extreme High: +15.0
Extreme Low: -4.5**

Cost: **N/A**

Date Completed: **August 1997**



Location: Place 18 in Eagle Harbor

Site History / Description

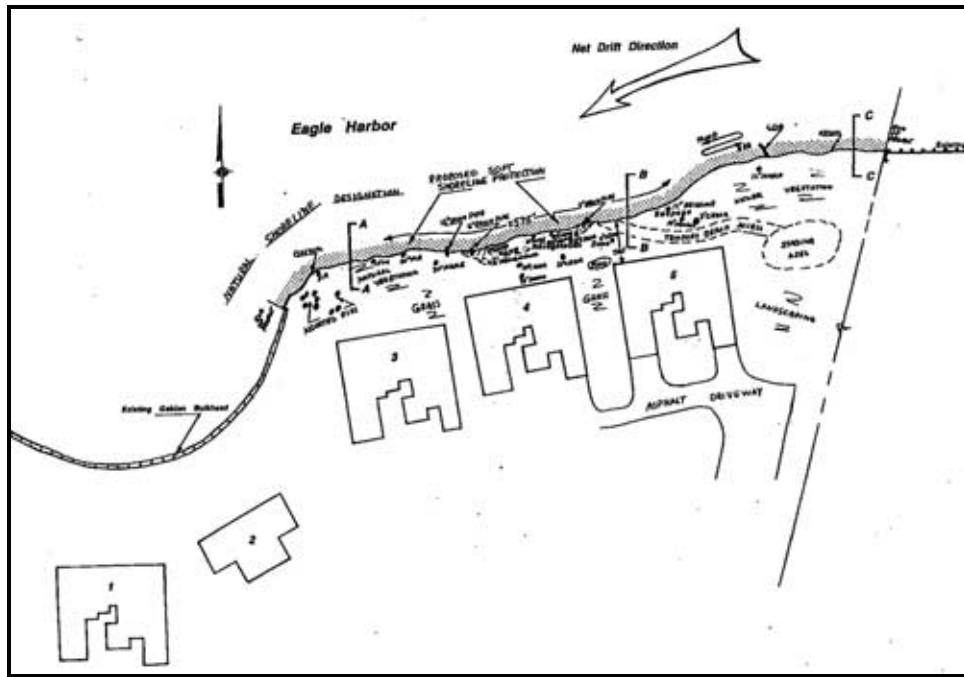
The Place Eighteen Condominium Complex was built at the head of Eagle Harbor on Bainbridge Island. The site has 575' of marine shoreline, consisting of a 4-8-foot high bank. This property is designated as a conservancy shoreline under the Bainbridge Island Shoreline Master Program, which in turn led to a no-bulkheading condition when the condominiums were first constructed.

The site is marked by poor drainage, limited vegetation coverage, and was subject to freeze-thaw cleaving during the winter months. These factors, in addition to tidal action, resulted in significant undercutting of the bank. This erosion extended across all but the easternmost 100' of the site.

Both the erosion issue and the shoreline designation were well documented prior to siting and constructing the complex and the developers were aware that no erosion control measures would be permitted. The resulting soft-bank project reflected a compromise between property owners concerned about erosion and the conditions imposed on the site regarding conventional erosion control structures.

Project Description

The project combined armoring of the undercut areas and the placement of mixed gravel on the beach. Vegetation was pruned back to provide open access to the bankline. The voids were lined with geotextile fabric. Quarry spalls, 4-8 inches in diameter, were hand placed in the undercut voids and the beach and bankline (spalls) were covered with gravel/sand mix that ranged in size from 3-inch minus down to course sand. The gravel cap extended from the bankline out approximately 20 feet. The eastern portion of the project did not require quarry spalls and was simply capped with the mixed gravel and sand.



Prior to construction, the WDFW habitat biologist required that a gravel work mat be laid down before any heavy equipment was allowed on the beach. This work mat consisted of two layers of 3/8ths minus "pea" gravel separated by a layer of geotextile filter fabric. The mat was approximately 15 feet wide and ran the full length of the site. This requirement reduced siltation and protected the beach from being churned up by large tires and tracks of the construction equipment. When the mat was no longer needed, the top gravel layer was removed by peeling back the fabric. The gravel was then integrated with the additional gravel used on the beach.

Monitoring

No official monitoring is being performed, although periodic site inspections and photographs have been made.

Success

The project has been successful in preventing erosion on site. The addition of gravel into a mudflat community has had some effect on the biotic community. A large colony of rockweed (*fucus*) has established which would not have been present on the finer substrate that existed prior to the project, but overall the beach appears to be biologically productive. In addition, fine sediment is beginning to settle on the gravel and may gradually reclaim the beach surface.

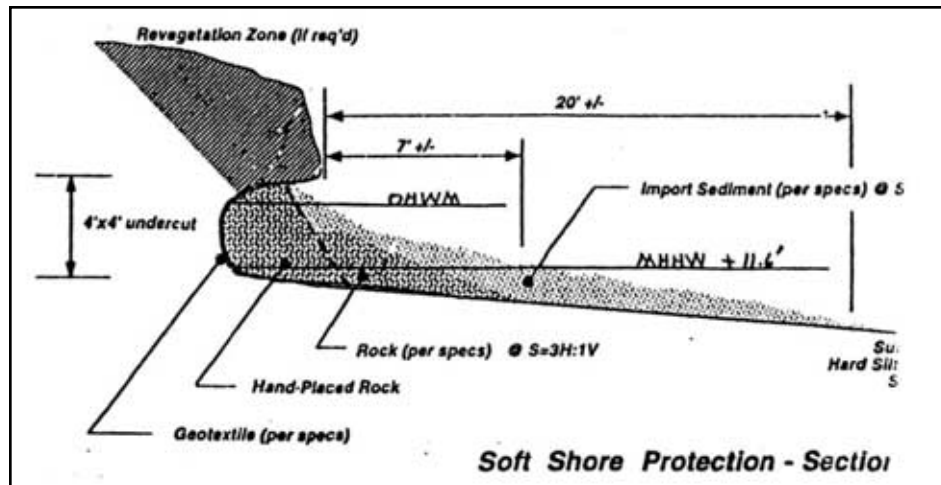
Alternatives Considered

The property owners initially proposed a rock bulkhead. Conditions on the original development, along with the site's Conservancy shoreline designation, removed this alternative from serious consideration.

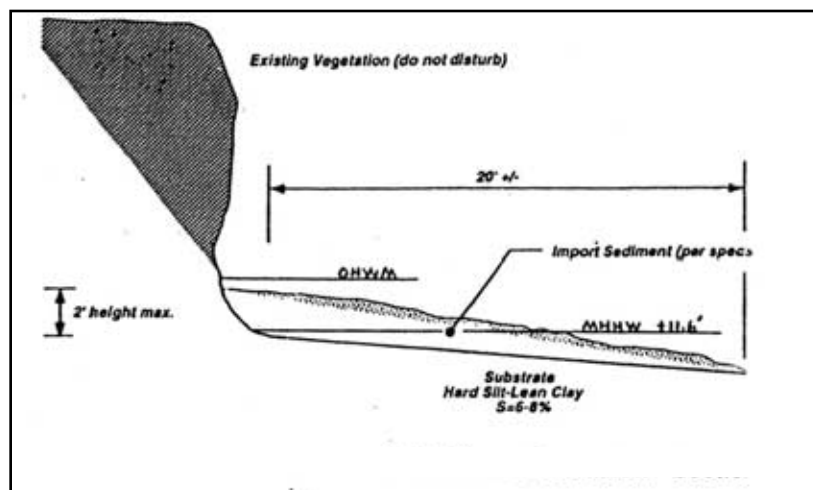
Contacts

Bainbridge Island Planning Department.	K. James
WA Department of Fish & Wildlife:	J. Brennan (now with King County DNR)
	J. Boettner (now with WA State DNR)
Washington Department of Ecology	H. Shipman
Myers Biodynamics:	R. Myers

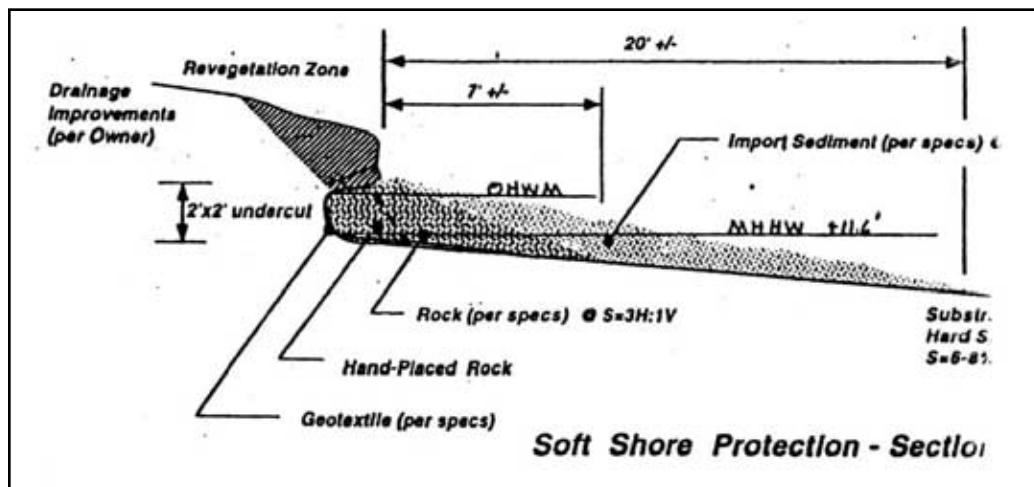
Project Design Profile



Profile: Section A



Profile: Section C



Profile: Section B



Figure 1. Gravel beach and vegetated bank. Quarry spall was placed at the toe of the slope and is largely covered with gravel. Aquatic vegetation is colonizing the coarse gravel, which is relatively stable in this low energy environment.



Figure 2. View of central portion of site, looking east. Note recent high tide line and wrack on gravel. By raising beach elevation, opportunities for waves to erode the toe of the bank are greatly reduced.



Figure 3. Beach and bank, looking west.

Salsbury Point Park

Address: **Salsbury Point Park, Kitsap County**

Region: **East side of the Hood Canal -just north of the Hood Canal Floating Bridge**

Designer: **Kitsap County Parks Department**

Contractor: **Kitsap Co. Public Works Department**

Owner: **Kitsap County Parks Department**

Shoreline Type: **Historic Beach**

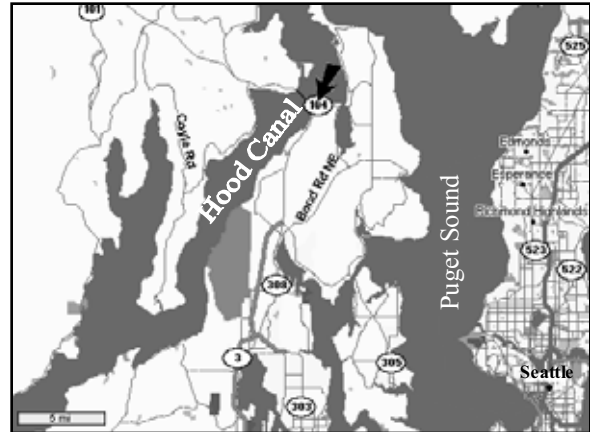
Project Type: **Nourishment**

Wave Energy: **Medium**

Tides: **MHHW: +8.45
Extreme High: +11.77
Extreme Low: -4.5**

Cost: **\$389,000 (all work)**

Date Completed: **October 1995 (upland park improvements completed in 1999)**

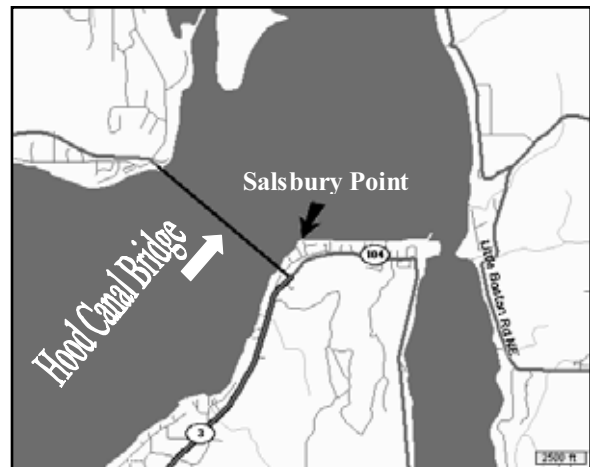


Location: Salsbury Point in Puget Sound

Site History / Description

Salsbury Point Park is located on the east shore of Hood Canal just north of the Hood Canal floating bridge. The site includes six and a half acres and has 512' of marine shoreline. The beach was originally part of a sand spit, salt marsh system. The wetland was filled in the 1960s. The Hood Canal Bridge reduces wave action from the south and appears to have reduced littoral drift to this site.

The northeast end of the site is marked by a pair of concrete boat ramps and an easement for a cable crossing that has been armored with small rock and spalls. Significant historic erosion of the site had been addressed by periodic dumping of rock and debris, which had limited success and had compromised the public and recreational value of the site.



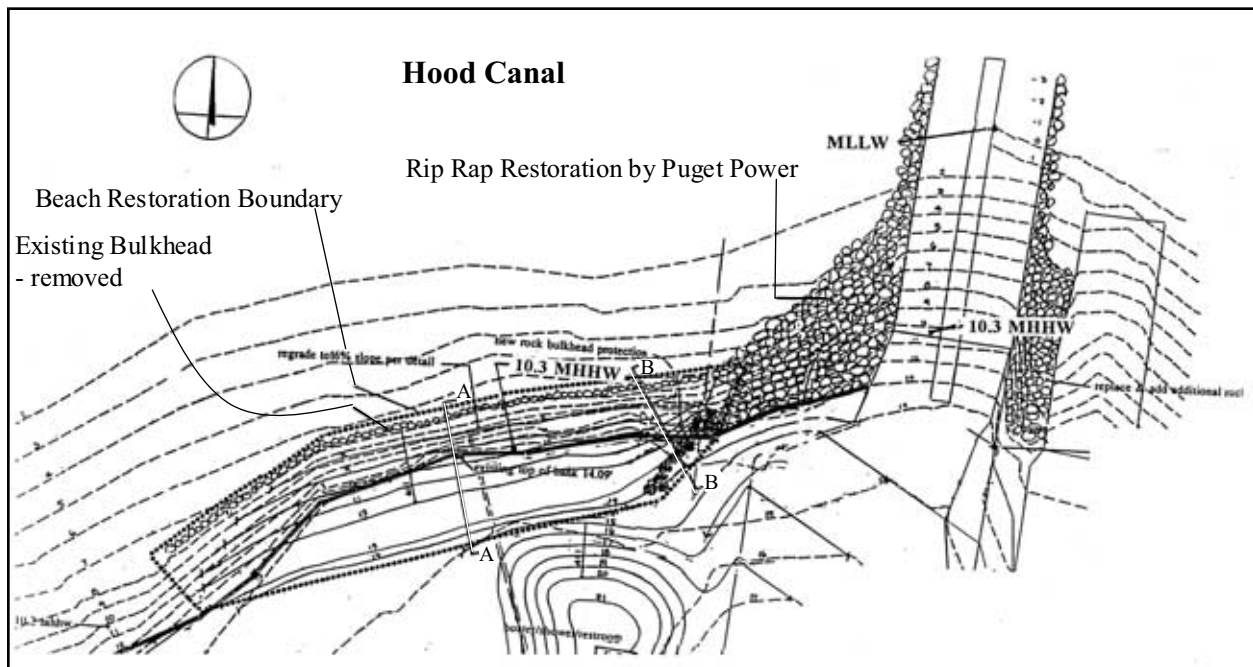
Location: site on Hood Canal

Project Description

The Salsbury Point project involved beach nourishment of about 300' of shoreline (Profile A-A') and the construction of a rock wall at the eastern end of the beach (profile B-B'). The rock wall is perpendicular

to the beach. Continuation of the beach farther east was prevented by the rockwork at the cable crossing and the boat ramps, which project a considerable distance across the beach. The wall was constructed of rocks previously placed as erosion protection in the area of the restored beach.

Beach construction involved the removal of the large rock and excavation of the existing substrate to a depth of two to three feet. Approximately 2000 cubic yards of 3"-minus gravel was imported to create a beach slope of about 6H:1V from the berm (about 12 feet MHHW) down to a mid-tidal elevation of 7 feet MHHW. Approximately 6 inches of beach sand was placed on the berm, in addition to logs and several large boulders.



Salsbury Point Park: Plan

The beach work was tapered into the existing beach to the west. Hay bales were placed along the upland edge of the project to prevent upland runoff from eroding the newly placed beach sand in the backshore.

It is important to note that the cost of the project includes not only the beach enhancement work, but the cost of the new boat ramp and the upland park renovations.

Monitoring

The project was closely monitored monthly for a period of 24 months by Hugh Shipman with the Washington Department of Ecology. He has followed its progress since then but not as rigorously. A strong northerly storm in November, 1996, resulted in significant erosion of the eastern end of the beach which would not have been evident except from measured beach profiles.

Salsbury Point Park

Success

The project appears to be performing well. It is susceptible to northerly storms, but more common southerly storms have resulted in the accretion of sand during some winters. Beach grasses and other backshore vegetation were never planted deliberately, but have gradually re-established on their own. The site is expected to require periodic nourishment, although in relatively minor volumes.

Alternatives Considered

A rock bulkhead was originally considered for the site but nourishment proved to be the preferable alternative.

Contacts

Department of Ecology: H. Shipman

Kitsap County Parks Department: L. Cote

Washington Department of Fish and Wildlife J. Boettner (now with WA State DNR)

Project Design Profiles: With and Without Rock Bulkhead

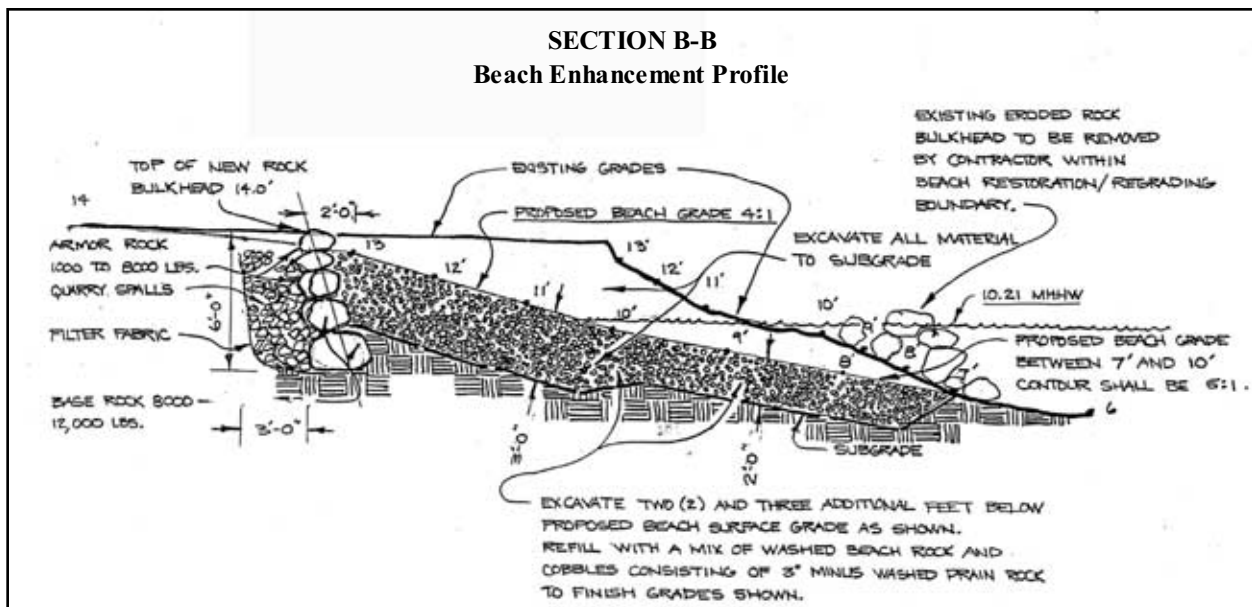
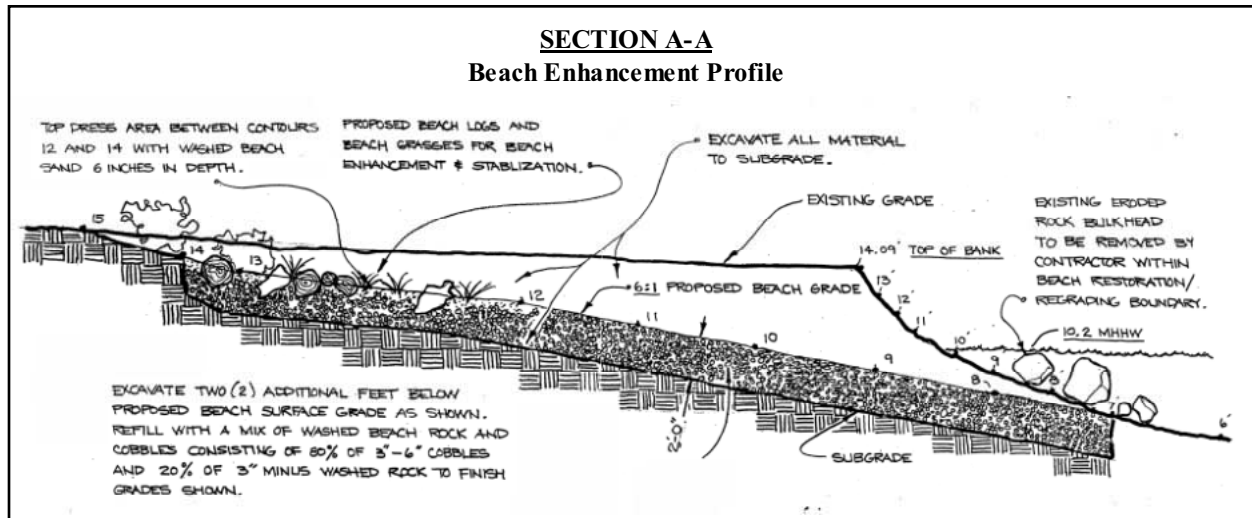




Figure 1. View west showing gravel beach and backshore. Large logs in the backshore were placed at construction, whereas most vegetation has reestablished naturally (1999).



Figure 2. Second view to west, showing more of beach and Hood Canal Bridge in background (1999).



Figure 3. View east of project area prior to nourishment. Note scarp in eroding artificial fill and rocks placed in effort to reduce erosion (1995).



Figure 4. View to the east immediately following construction (Fall, 1995), showing gravel beach and recent high tide line. Note sand placed on landward portion of the berm.

Salsbury Point Park



Figure 5. 1999 photo shows an erosional scarp in sandy berm. This sand was deposited during the winter of 1998-1999 by movement of drift from the south and was gradually eroded by summer wave action from the north. This illustrates natural variability common to both natural and nourished beaches.

Samish Beach

Address: **West North Beach, Samish Is.**

Region: **North Puget Sound, Samish Bay**

Designer: **Coastal Geologic Services Inc.**

Contractor: **Waterfront Construction**

Owner: **16 Private Properties**

Shoreline Type: **Historic Beach / mudflat.**

Project Type: **Protective Gravel Berm, Drift Sill**

Wave Energy: **High**

Tides: **MHHW: +8.6
Extreme High: +11.5
Extreme Low: -4.5**

Cost: **\$250,000**

Date Completed: **Fall 1998**

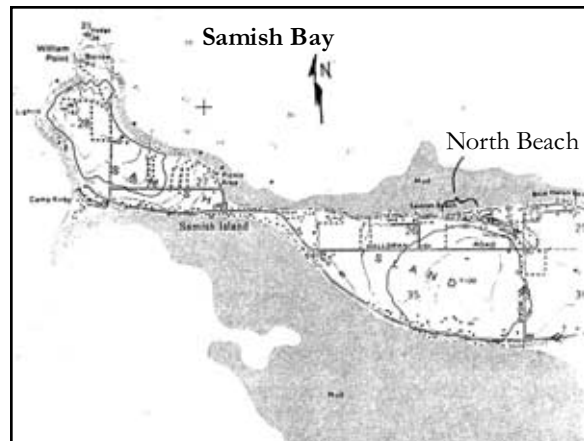


Location: Samish Is. In Northern Puget Sound

Site History / Description

Samish Island is a peninsula that juts westward into northern Puget Sound just south of Bellingham.

The past 100 years have seen it transformed from a true island into a peninsula by the expanding Skagit/Samish River delta. There used to be more marsh and mudflat on the island but significant areas have been diked and filled to create agricultural land.



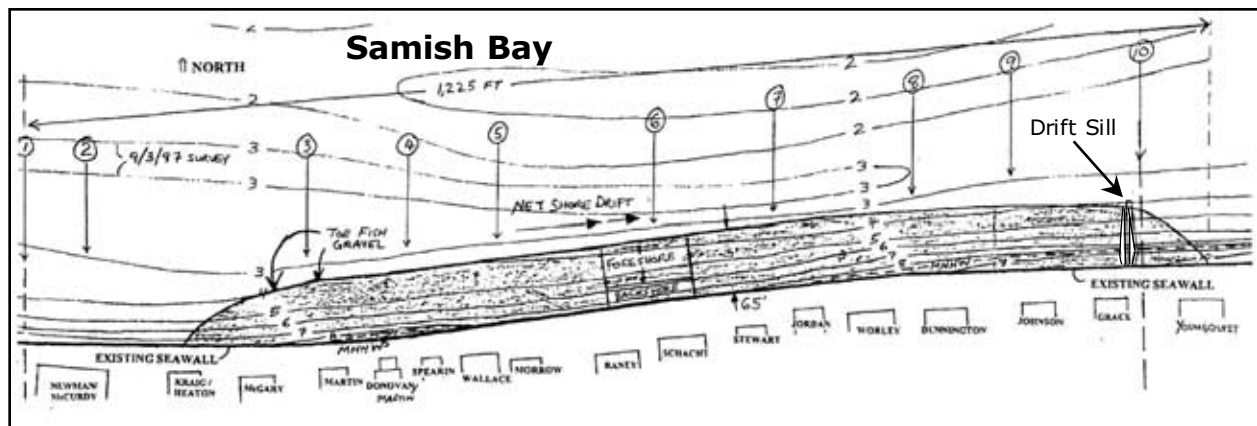
Location: North Beach on Samish Island

North Beach is on the north shore of the island just east of its center. Historically it was a beach with a gradual berm. A high bluff is located upland (south) of the beach and there is an extensive offshore flat at low tide. Development in the area began as early as 100 years ago. Cottages were constructed between the bluff and the beach. The predominant longshore drift on site is from west to east therefore manmade changes to the west (updrift) are of most importance.

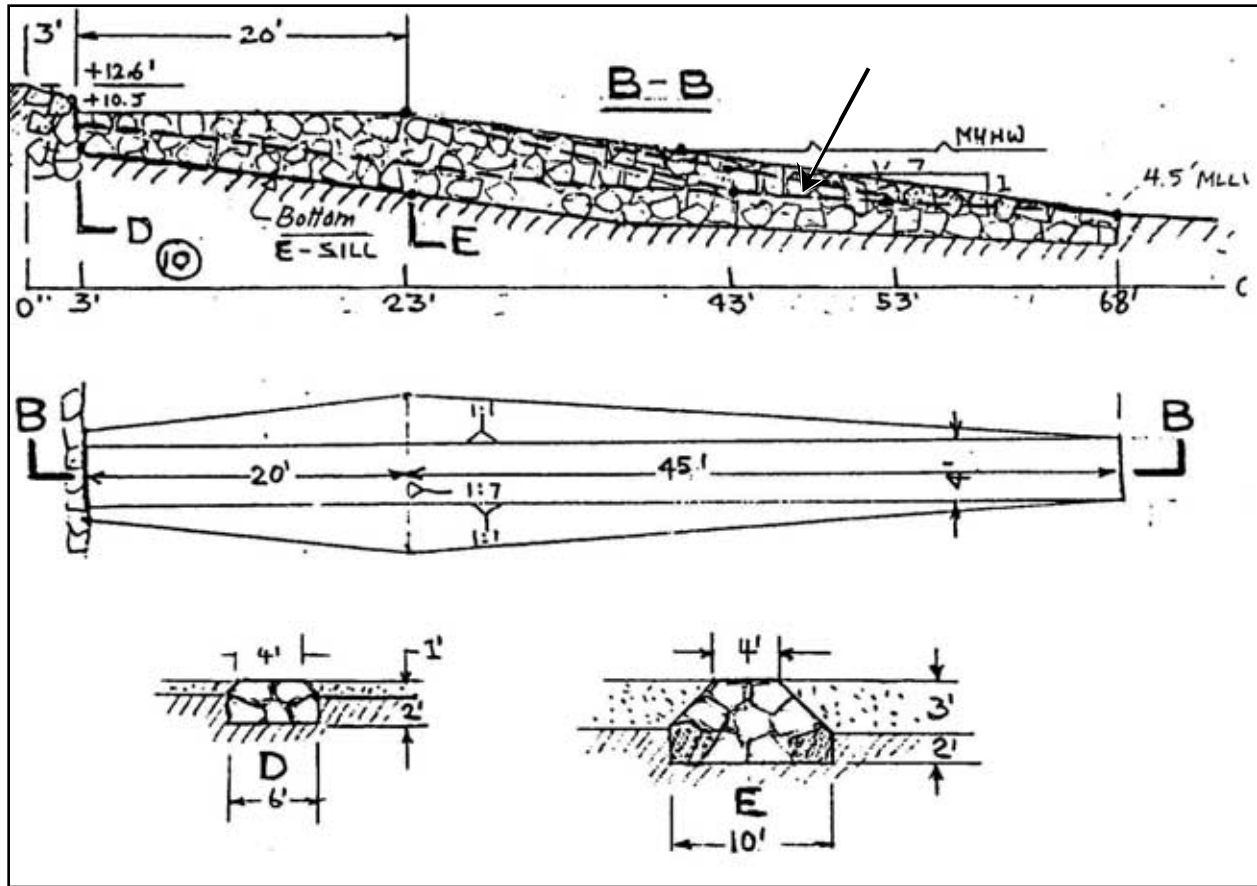
There are a number of significant structures. A groin was built on the west end of the beach in the early part of the century (probably 1920's or 30's). This artificially increased the width of the beach in this

area, but the structure was gone by the 1960s. The beach is now seeking to reestablish a natural equilibrium and erosion is cutting into the deposit. To the west are two manmade promontories. These extend into the water as much as 100' blocking a significant amount of sediment moving toward North Beach and possibly divert more sediment offshore. A series of groins occur west of the beach and two more small groins are present on the west end of North Beach. These are also trapping and diverting sediment. Finally, extensive bulkheading has cut off the primary sediment source to the beach. Erosion of the bluffs was the primary source of sediment maintaining beaches along the north side of Samish Island. Now the source has been cut off and the system is starved of sediment, exacerbating the effects of the other structures.

The changes to the beach in the past century have created significant impacts to the beach and resulted in serious erosion problems during the past two decades. North Beach residents installed bulkheads from the late 1970's through 1982 in an attempt to protect their properties from erosion. The bulkheads increased wave energy on the beach which in turn scoured out the fine sediments and lowered the beach significantly. In 1996 three bulkheads failed and the residents began to aggressively consider alternatives to erosion control.



North Beach Plan / Profile Locations



North Beach: Details of drift sill (groin)

Project Description

Coastal Geologic Services designed the project with additional design input from Wolf Bauer. The project on North Beach consisted of two parts. A drift sill (groin) was constructed at the east end of the beach. This was followed but the construction of a protective berm in front of the 16 properties involved.

The drift sill was built at the east end of the beach. Essentially it is a groin constructed flush with the new beach grade (7H:1V) at the down drift end of the site. The sill is designed to retain the nourishment that was added by the project while still allowing long shore drift to carry sediment normally down the beach above the new grade. Eighty tons of rock were used in its creation.

The second phase of the project was constructing the new berm. The nourishment stretches from the Grace residence west for approximately 1000 feet. The berm is composed of two layers. Seven thousand yards of berm gravel (3/4"-3") make up the majority of the fill. This was molded to create the bench and a 4.5H:1V grade beach. Then the beach slope was brought up to 7H:1V by adding 1500 yd³ of smaller gravel (3/4" minus). This material is intended to provide habitat favorable for surf smelt spawning. The

site was a documented surf smelt spawning beach, albeit in significantly degraded condition. The goal of adding this finer gravel was to mitigate the damage done by the project, not to restore the beach to its historical condition. In addition to the gravel, 260 yd³ of sand were added to the berm.

Monitoring

The project has passed through one winter to date and looks to be in good condition. Some vegetation has established itself naturally but no formal plantings have been done yet.

There is an official monitoring program to be performed by Coastal Geologic Services, Inc.. Monitoring will be performed twice a year for the first three years and will be composed of profile (8 transects) and sediment (4 upper intertidal samples) monitoring. The sampling will be performed once in each of years four and five.

Success

The project has been successful to date.

Alternatives Considered

Four Alternatives were considered for North Beach: no action, new beach and backshore plus bulkhead removal, nourishment without building a new berm and new beach and backshore with present bulkheads. The no action alternative was not appealing to most property owners. It would have resulted in continued beach loss and additional bulkhead failures. The designers felt that the ideal solution would have included removing all the present bulkheads and building a protective beach and berm, but the landowners were reluctant to do so. Nourishing the site without building a berm was discarded because it would have been a short-term solution requiring continuing and possibly frequent renourishment. The alternative that was chosen was a compromise between what the designer thought would provide the best protection and the homeowners' desire to have bulkheads between their homes and the water. The result is a berm and backshore that are narrower than optimal but the project will still provide adequate protection with minimal upkeep. This alternative was also the one that 16 separate landowners could agree on. This ability to achieve consensus was a critical deciding factor.

Samish Beach

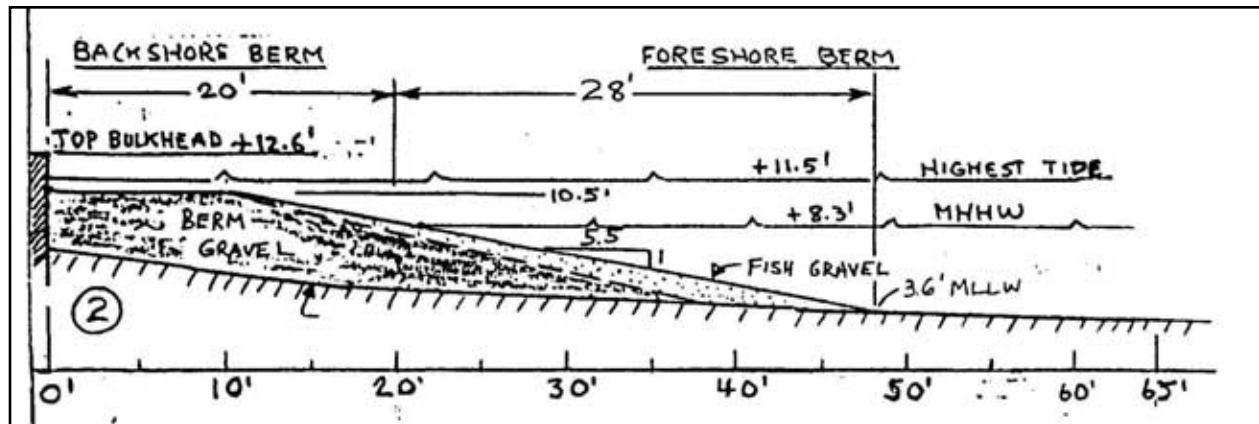
Contacts

Washington Department of Ecology:	H. Shipman
Washington Department of Fish & Wildlife	B. Williams
Coastal Geologic Services, Inc.:	J. Johannessen
Army Corp of Engineers	C. Barger

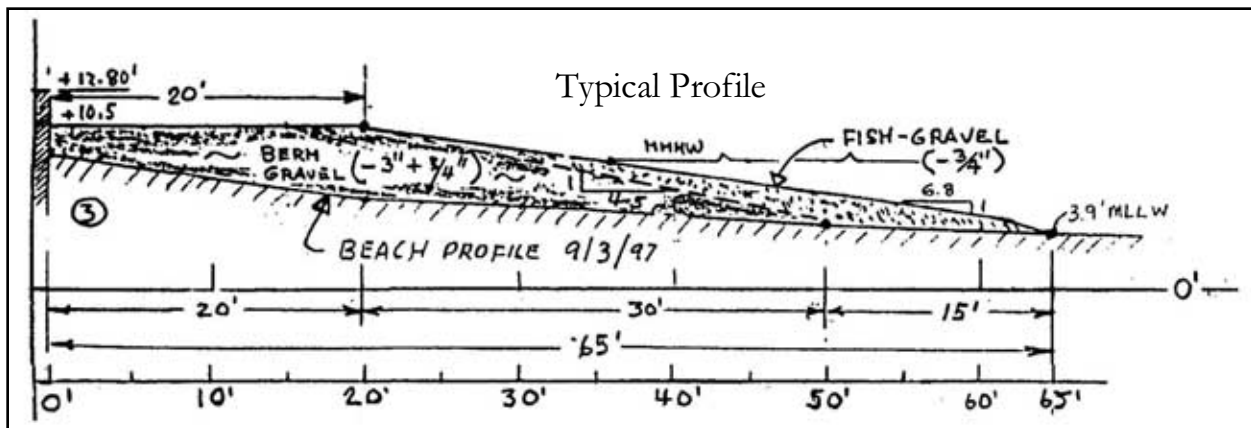
References

Shipman, H. 1998. *Shoreline Changes at North Beach, Samish Island*. Shorelands and Environmental Assistance Program, Washington Department of Ecology, Olympia, Publication # 98-101.

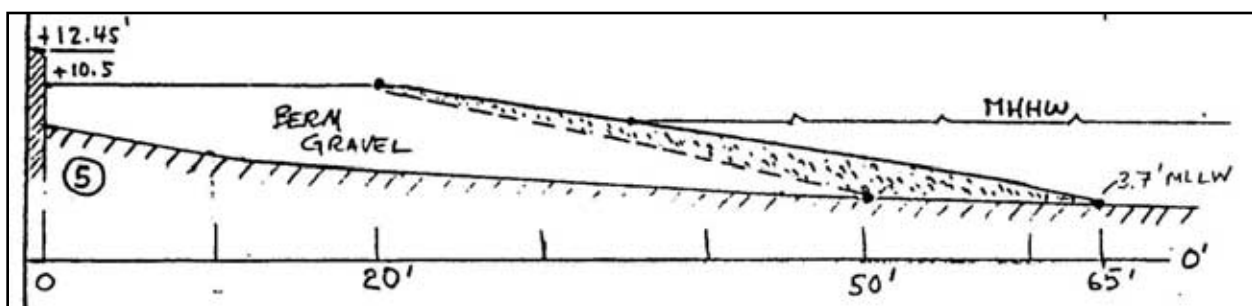
Project Design Profiles



Profile: North Beach Transect # 2



Typical Profile: North Beach Transect #3



Profile: North Beach Transect #5

Samish Beach



Figure 1. View west from the east end of the project. Note broad gravel berm and recent accumulation of beach wrack. Prior to nourishment, the bulkheads at the left were in danger of undermining.



Figure 2. Looking west at project, including drift sill (groin) that forms eastern end of nourishment. Note that beach is considerably lower on east (left) side of structure. It is important that gravel be able to continue to bypass the structure in order to feed downdrift beaches.



Figure 3. View west along bulkhead line in central portion of project. The bulkhead in the foreground failed in the winter of 1996-1997 (see Figure 6). Note elevation of backshore and placement of sand to facilitate revegetation.



Figure 4. Ecology-block bulkhead located immediately west of project area.. Riprap has been added to protect base from scour.



Figure 5. Photo taken immediately prior to bulkhead construction in 1982 along east-central portion of project site. Note line of drift logs and narrow berm
(Photo: courtesy of Marge Dunnington)



Figure 6. Ecology-block wall prior to nourishment. Failure occurred in the winter of 1996-1997 by undermining and excess hydrostatic pressure - upper tier has been restacked in this photo. Note erosion of upland area behind wall.